CLAIMS

1. An RFID tag device comprising a divided microstrip antenna, a power receiving circuit based on a combination of a stub resonance-based, impedance transformation RF boosting scheme and a ladder boosting/rectifying scheme, and a local oscillator circuit for generating a response subcarrier signal,

wherein a dividing position of the divided microstrip antenna is slightly deviated from a longitudinal center point across strip conductors.

2. The RFID tag device according to claim 1 being an RFID tag as a modulation scheme of which a passive QPSK modulation method is usable.

3. The RFID tag device according to claim 1 or 2, wherein impedance modulation elements of the divided microstrip antenna are respectively connected to opposite ends in a strip conductor width direction so as to connect divided conductors.

4. The RFID tag device according to claim 3, wherein the impedance modulation elements are PIN diodes or varactor diodes.

5. The RFID tag device according to claim 3, wherein the impedance modulation elements constitute a voltage or

current controlled three-terminal element using a transistor, rather than a diode.

6. The RFID tag device according to any one of claims 1 to 5, wherein an extremely small capacitance of 1 pF/GHz or less is used for connecting the power receiving circuit and an antenna feeding point to perform high-impedance capacitive feeding.

7. The RFID tag device according to any one of claims 1 to 6, wherein capacitive load impedances in a stub resonator and a ladder boost rectifier circuit of the power receiving circuit are parallel resonant, and further, the capacitive feeding impedance are series resonant.

8. The RFID tag device according to any one of claims 1 to 7, wherein when considering longitudinal connections of capacitors in the ladder boost rectifier circuit of the power receiving circuit as GND- and receiving-side rails, capacitor capacitance of the receiving-side rail is smaller than that of the GND-side rail, a first diode between GND and a receiving point is eliminated, and a high-frequency and high-impedance input is receivable by a DC short.

9. The RFID tag device according to any one of claims 2

to 8, wherein a logic circuit including a 1/4 frequency divider, a shift register and a data selector is used in the passive QPSK modulation method.

10. The RFID tag device according to claim 9, wherein MPSK modulation is applied by using a 1/M frequency divider, an M-stage shift register and an M-input data selector.

11. The RFID tag device according to any one of claims 2 to 9, wherein information is recorded to a memory in units of two bits in accordance with the passive QPSK modulation method.

12. The RFID tag device according to any one of claims 2 to 9 and claim 11, including an output timing generator circuit for obtaining an output enable signal in the passive QPSK modulation method.

13. The RFID tag device according to claim 12, wherein the output timing generator circuit generates a train of pulses with a random delay time having a fixed width and a fixed frame cycle, based on a source voltage size and a clock signal.

14. The RFID tag device according to any one of claims 1 to 13, wherein by using a transducer such as a

temperature sensor quartz resonator as the local oscillator circuit for generating the response subcarrier signal, a sensor function capable of allowing its oscillating frequency to be read by an external unit is additionally used.

15. A position detecting method for a mobile object having no RFID tag, wherein in a system composed of an RFID device as claimed in any one of claims 1 to 14 and one or more master devices (interrogators), whether or not an obstacle is present in a radio wave propagation path extending between each RFID tag device and each interrogator is determined based on the presence or absence of communication between the RFID tag and the interrogator.

16. The position detecting method for a mobile object having no RFID tag according to claim 15, wherein in the position detecting method for a mobile object having no RFID tag, a plurality of radio wave propagation paths present between each RFID tag and each interrogator are distinguished based on a combination of a local oscillating frequency for generating a response subcarrier of each RFID tag, a response timing, a frequency of an interrogation radio wave outputted from the interrogator and timing of generating the interrogation radio wave.

17. A position detecting method for a mobile object having an RFID tag, wherein radio waves at two or more frequencies are transmitted to an RFID tag device as claimed in any one of claims 1 to 14 from an interrogator having two or more antennas dedicated for reception or used for transmission and reception, and based on a difference in phase (a difference in delay time) between receiving antennas in a signal for response thereto, maximum likelihood determination of a position of the RFID tag is performed.

18. The position detecting method for a mobile object having an RFID tag according to claim 17, wherein in order to enable a three-dimensional RFID tag position determination, an interrogation device having four or more antennas dedicated for reception or used for transmission and reception is used to eliminate a commonly measured distance offset by obtaining a group delay time in each radio wave propagation path based on four or more sets of frequency responses measured for the two or more frequencies, and obtaining a difference in delay time with reference to at least one of the sets.

19. The RFID tag device according to any one of claims 1 to 14, including two or more tag antennas in order to expand its possible communication range.

20. A communication method, wherein an RFID tag device as claimed in claim 19 periodically changes directionality of an intense response subcarrier radio wave, which is synthesized by periodically changing a phase of a local oscillating signal provided to each tag antenna for generating a response subcarrier signal, thereby returning an intense response radio wave toward an interrogator in a wide area.